SECTION 10675
MOBILE STORAGE SHELVING UNITS

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes the following:

1. Electric, carriage mounted high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.

B. Related Work

1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including rolling loads of storage units to be installed

2. Finish floor covering materials and installation on raised floors and ramps, or when on concrete with recessed rail installation.

3. Power wiring to units from adequate power supply. Final connections to units shall be provided by installer.

C. Related Sections:

1. Division 16 for power wiring devices, conductors and circuit protection.

1.02 SYSTEM DESCRIPTION

A. General: The system shall consist of manufactured storage units mounted on manufacturer's track guided carriages to form a compact storage system. System design shall permit access to any single aisle by moving units until the desired aisle is opened. The manufacturer's proprietary unit interlock system shall prevent from being moved while the open isle is occupied. The carriage/rail system shall provide uniform carriage movement along the total length of travel, even with unbalanced loads.

B. Carriage System and Design Features: the carriage system shall consist of a formed structural steel frame with hardened steel wheels riding on steel rails mounted to the floor. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without endplay or binding.. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

C. Movement Controls: Provide a carriage control panel on the accessible (open) end of each moveable carriage, located 44 inches above the base, centered n the face panel. Minimum controls shall include directional control buttons, RESET/STOP push button and a red reset light., which flashes continuously until reset button is pushed.

1. System controlled shall start motors on each moveable carriage sequentially to minimize power demands and shall provide dynamic braking to provide smooth operation. Maximum running speed shall be limited to 3 inches per second.

2. Provide solid\state controls and indicator lights for a visual indication of safety system operation. Provide each aisle with an adjustable limit switch to ensure proper timing for start/stop operation.

3. Pushing the control button on any moveable carriage adjacent to the desired aisle location in the direction away from the desired aisle opens the system at the desired aisle. The selected aisle shall open automatically regardless of the position of the carriages. The carriage control head will display a flashing red reset light a the newly opened aisle indicating that the aisle is locked open and requires resetting before another aisle can be opened. Provide for automatic lockout and manual reset of controls if selected aisle is not moved within a preset period of time.

4. Controls shall feature back-lit message indicating which aisle is in use (i.e. "right aisle in use" or "left aisle in use").

D. Drive System: The system shall be designed with a positive type power-assisted drive which minimizes end play and that carriages will stop without drifting. All system components shall be selected to ensure a smooth, even movement along the entire carriage length.

1. Each electric carriage shall be provided with a current limited fractional horsepower gear motor, connected to a drive wheel assembly (ies) with a roller chain.

2. System shall include a chain sprocket drive system t ensure that carriages move uniformly along the total length of travel, even with unbalanced loads.

3. A tensioning device shall be provided on each chain drive.

4. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

5. System shall operate on 115 V.A.C.50/60 hertz, 20 amp dedicated circuit provided by others, one per module.

6. Overhead mounted power pantograph distribution system shall conceal all interconnecting wiring.

E. Safety Features:

1. One safety sweep shall be provided for each aisle. A full-legnth mechanical safety sweep strip shall be provided to stop carriage movement if the sweep contacts any obstruction while in motion. Sweep must be equipped with OSHA approved safety demarcation tape.

2. A rechargeable power pack shall be provided for emergency operations in case of primary power failure.

3. Entire system must be UL system listed.

4. Infrared photoelectric safety sweep shall be provided to stop carriage movement if the system detects objects or persons in the aisle while the carriage is in motion.

5. Infrared photoelectric aisle entry sensor system shall be provided to stop carriage movement if the system detects persons entering a closing aisle.

F. Finishes:

1. Fabricated Metal Components And Assemblies: Manufacturer's standard power coat paint finish.

2. End Panels, Accessible Ends: Manufacturer's standard power coat paint finish in standard available colors.

1.03 PERFORMANCE REQUIREMENTS

A. Seismic performance: Provide mobile storage units capable of withstanding the effects of earthquake movement as required by applicable building codes.

1.04 SUBMITTALS

A. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data; Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with the requirements of the subcontract documents.

C. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exits and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and

deck details, edge conditions, and extent of finish flooring within area where units are to be installed.

1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties and accessories

2. Provide layout, dimensions, and identifications of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:

   a. Location, position and configuration of tracks on all floors.

   b. Plan layouts of positions of carriages, including all required clearances.

   c. Details of shelving, indicating method and configuration of installation in carriages.

3. Provide location and details of anchorages devices to be embedded in of fastened to other construction.

4. Provide installation schedule and complete erection procedures to insure proper installation.

5. Show locations of wiring and disconnects required for operating moveable carriage units..

D. Samples: Provide 3-inch square samples of each color and texture on actual substrate. This for color selection.

E. Selection Samples: for initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors ad textures available.

F. Installer Certificates: Furnish signed certification by manufacturer attesting that installers comply with specified requirements. Submit manufacturer's certification that products comply with requirements of the subcontract documents.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: engage an experienced manufacturer for the design, production, installation and service of programmable electric, carriage mounted high-density mobile storage units and support rails.

B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.

1. Minimum Qualifications: 1-year experience installing systems of comparable size and complexity to specified project requirements.

C. Manufacturer's Certification: Provide separate written certifications by manufacturers on manufacturer's letterhead stating compliance with all specifications of mobile and shelving systems. Shelving certification must confirm compliance with actual shelf sizes as noted in these specifications. Provide separate certifications for mobile and shelving, if from different manufacturers.

1. Certifications from entities other than the original manufacturer are unacceptable.

2. Guaranteed 24-hour minimum response to service call.

1.06 DELIVERY, STORAGE AND HANDLING

A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile storage units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.08 SEQUENCING AND SCHEDULING

A. Sequence storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.

B. Provide components, which must be built at a time which causes no delays to general progress of the Work.

C. Pre-installation Conference: Schedule and conduct on project site to review methods and procedures for installing mobile storage units including but not limited to the following:

1. Review product condition and levelness of flooring and other preparatory work performed under other contracts.

2. Review and verify structural loading limitations.

3. Recommend attendees include:

   a. University Representative

   b. Subcontractor

   c. Manufacturer's representative

   d. Subcontractor installers whose work may affect, or be affected by, the work of this section.

1.09 WARRANTY

A. Provide a written warranty, executed by the Subcontractor, Installer and Manufacturer, agreeing to repair or replace units, which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the University may have under General Conditions, provisions of the Subcontract Documents.

B. Warrant the entire moveable compact shelving installation against defects in materials and workmanship for a period of five years from the date of acceptance by the University.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General: Products are based upon mobile shelving system products manufactured by Spacesaver Corporation. Contingent on meeting specification requirements, other acceptable manufacturers include:

   1. Ames
   2. Nordplan USA, Inc.
   3. Or Equal.

2.02 BASIC MATERIALS

A. General: Provide materials and quality of workmanship which meet or exceed established industry standards for products specified. Commercial grade or case-type shelving will not be acceptable Use furniture grade sheet metal for component fabrication unless indicated otherwise. Material thickness/gauges are manufacturer's option unless indicated otherwise.

B. Plastic Laminates: NEMA LD-3, GP28, Vertical Grade

C. Electrical Devices and Controls: UL listed for type of application and service

2.03 GROUT

A. General: Provide non-shrink, non-staining hydraulic cement compound conforming to the following requirements, based on the performance of the test specimens at room temperature and in laboratory air.

1. Linear Movement: no shrinkage while setting; maximum expansion limited to .002 inches per linear inch.

2. Compressive Strength: based on two inch cubes made following ASTM standards, tested on a Balding-Southward machine of 60,000 pounds capacity meet or exceed the following:

a. Age: 1 hour --- 4,500 psi
7days --- 8,000 psi

2.04 MANUFACTURED COMPONENTS

A. Rails:

1. General: Provide manufacturer's proprietary design units with the following properties:

2. Material: ASTM/AISI Type 1035 or 1045 steel, manufacturer's selection.

3. Capacity: 1,000 pounds per lineal foot of carriage.

4. Minimum Contact Surface: 5/8 inch wide.

5. Provide rail sections in minimum 6-foot lengths.

6. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.

7. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections, Butt joints are not permitted.

8. Once rails are leveled, they shall be supported the full length with the specified grout.

B. Carriages:

1. Provide manufacturer's design moveable carriages fabricated of welded or bolted steel construction. Galvanized structural component s and/or riveted carriages are unacceptable, anchored to rails. 1,000 pound per foot minimum capacity.

2. Provide fixed carriages of same construction and height as the moveable carriages, anchored to rail. Setting fixed shelving directly on floors is not permitted.

3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.

4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of of ¾ inch. Top mount carriages are unacceptable.

5. Provide each carriage with two wheels per rail.

C. Drive/ Guide System

1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/ rail wear under normal operation.

   a. If line shafts are used, all wheels on one side of carriage shall drive

   b. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.

   c. Shafts: Solid steel rod or tube.

   d. Shaft Connections: Secured couplings.

   e. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.

D. Wheels:

   1. Materials: Type 1045 solid steel. Minimum load capacity per wheel: 3200 lbs.

   2. Size; Minimum 5 inches outside diameter drive wheels.

   3. Guides: Determined by manufacturer; minimum 2 locations

E. Motors:

   1. Type: 90VDC

F. Face Panels:

1. Materials: Plastic laminate clad particle board with plastic edging on vertical edges.

2. End panels must cover the full height and width of shelving.

G. Shelving: (Four Post)

2.05 ACCESSORIES

A. Dual Control: Provide additional control panels at end of each power-assisted module.

B. Power Back override: Provide one additional rechargeable battery pack units to operate modules in case of main power failure.

C. Automatic Aisle lighting: Provide top-mounted fluorescent light fixtures

D. Stationary Aisle Lock: Provide key switch to make a moveable carriage into a stationary carriage.

2.06 FABRICATION

A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Wheels: Provide precision ground, balanced and hardened units with permanently shielded and lubricated bearings.

C. Carriages: Fabricate to ensure no mote than 1.4 – inch maximum deviation from true straight line. Splice and weld to ensure no permanent set of slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.

D. Shelving, Supports and Accessories: See individual descriptions in "Shelving" paragraphs.

2.07 FINISHES

A. Colors: Selected by Architect from manufacturer's standard available colors.

B. Paint Finish: Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Library Association.

C. Laminate Finish: Provide factory applied laminate panels at locations indicated on approved shop drawings.

D. Edgings; Provide preformed edging, color-matched to unit colors selected.

PART EXECUTION

3.01 EXAMINATION

A. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units

B. Verify that building structural system us adequate for installing mobile storage units at locations indicated on approved shop drawings. Ensure that recesses in rails in floors are at proper spacing and depths, with allowances for grouting..

C. Verify that intended installation locations of mobile storage units will not interfere with nor block established required exit paths of similar means of egress once units are installed

D. Verify that adequate capacity permanent power sources have been installed at locations indicated on approved shop drawings.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Rails:

1. Lay out rails using full length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings. Verify thickness of finished floor materials to be installed (by others) and install level 1/16 inch above finished floor surfaces.

2. Verify level, allowing for a minimum ¼ inch of grout under high points. Position and support rails so that no movement occurs during grouting.

3. Set Rails in grout bed, completely filling all voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor. Using shims in lieu of full grouting is not permitted.

4. Installation Tolerances: Do not exceed the levelness of installed rails listed below:

   a. Maximum Variation From True Level Within Any Module: 3/32 inch

b. Maximum Variation Between Adjacent (Parallel) Rails: 1/16 inch. perpendicular to rail direction

c. Maximum Variation In Height: 1/32 inch, measured along any 10-foot rail length.

5. Verify rail position and level: anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.

B. Floors/ Ramps:

1. General: Finished elevation shall be 1/16 inch below top rails .

2. Place floors and ramps to the extent indicated on approved shop drawings. Extend ramps under all moveable and stationary ranges. Do not exceed ramps beyond the ends of the carriages

3. Construct floors and ramps to prevent warping or deformation of floor panels in a normal operating environment. Support panels on levelers at maximum 16 inches on center.

4. Ramp Slope: Do not exceed the following:

a. ADA Accessible Ramps: Minimum 1:12 sope

b. Other Ramps: Maximum 9degree slope

c. Vertical transition, Ramp edge to floor: Maximum 1/8 inch

C. Shelving Units Installation:

1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb: at proper location relative to adjoining units and related work.

2. Carriages:

a. Place moveable carriages on rails. Ensure that all wheels track properly and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single moveable base where required.

b. Position fixed carriage units to align with moveable units: make final leveling adjustments with leveling screws.

3. Shelving Units:

a. Permanently fasten shelving units to fixed and moveable carriages with vibration proof fasteners.

b. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

4. Wiring

a. Make final control wiring connections between modules under single control.

b. Test wiring for continuity and proper connections with regulated field power supply before making final power connections.

c. Make final wiring connections to permanent power source.

d. Test system operation by cycling all units through complete operations sequences.

3.03 FIELD QUALITY CONTROL

A. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer's instructions.

B. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminated evidence of replacement.

3.04 ADJUSTING

A. Adjust components and accessories to provide smoothly operating, visually acceptable installation.

3.05 CLEANING

A. Immediately upon completion of installation, clean components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas on installation in neat, clean condition.

3.06 DEMONSTRATION/ TRAINING

A. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.

B. Schedule and conduct maintenance training with University maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform

3.07 PROTECTION

A. Protect system against damage during remainder of construction period. Advise University of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion

END OF SECTION